

AERO462 – Turbomachinery and Propulsion

Turbine Meanline Design Assignment

Submission deadline on Moodle only:

Mon, Dec. 4th 2023 at 11:59PM

Problem Statement:

You are required to come up with the meanline design of a turbine. The turbine is to be used in a small, cheap, turbojet.

Below are the design point specifications that you have received from the engine performance department:

Mass flow rate	20 kg/s
Turbine isentropic efficiency	0.9
Turbine inlet temperature	1100K
Turbine temperature drop	145K
Turbine pressure ratio	1.87
Turbine inlet total pressure	400 kPa
Shaft rotational speed	250 rev/s
Mean blade speed	340 m/s

As a turbine designer, you must go through a design process, by the end of which you propose the following:

- The number of stages
- The flow coefficient
- The reaction of every stage
- The inlet and exit blade angles of every stage
- The root to tip ratio of every stage

Your final solution must include:

- Assumptions
- Velocity triangles
- Hand calculations
- Iterative and automated calculations as needed using Excel or Matlab

- A final design, with all values listed in a table.
- Figures, charts, and graphs to support your solution and assumptions

Submission Instructions:

- Individual work only
- You must submit your solution in the form of a mini-report, with the following sections:
 1. Problem statement
 2. Assumptions accompanied with justification
 3. Methodology i.e. hand calculations
 4. Final design solution (in table format)
 5. Conclusion
- Write down your name and student ID clearly on the front page of the report.
- On Moodle, submit up to TWO files. Your report should be submitted in PDF format. Your calculations can be either a MATLAB, GNU OCTAVE, or EXCEL file. Use your name and student ID as the name of the file you submit, e.g. name_idnumber.pdf
- Make sure to submit your project well before the deadline to avoid potential internet problems.
- Only projects submitted on Moodle will be considered.